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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,974	06/27/2005	Yuichi Fujioka	2005_1029A	9262
513 7590 08/18/2009 WENDEROTH, LIND & PONACK, L.L.P. 1030 15th Street, N.W., Suite 400 East Washington, DC 20005-1503				
EXAMINER				
MCCRACKEN, DANIEL				
ART UNIT		PAPER NUMBER		
1793				
MAIL DATE		DELIVERY MODE		
08/18/2009		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/540,974

Applicant(s)

FUJIOKA ET AL.

Examiner

DANIEL C. MCCracken

Art Unit

1793

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 6/8/2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4, 8-13, 15-28, 32-37 and 39-47 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 8-13, 15-28, 32-37 and 39-47 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Citation to the Specification will be in the following format: (S. # : ¶/L) where # denotes the page number and ¶/L denotes the paragraph number or line number. Citation to patent literature will be in the form (Inventor # : LL) where # is the column number and LL is the line number. Citation to the pre-grant publication literature will be in the following format (Inventor # : ¶) where # denotes the page number and ¶ denotes the paragraph number.

Status of Application

The finality of the Office Action dated 1/6/2009 is withdrawn in light of the Request for Continued Examination ("RCE") dated 6/8/2009. Claims 1-4, 8-13, 15-28, 32-37, and 39-47 are pending, with Claims 1-4, 12-13, 15, 18-20, 23, 25-26, 33, 36-37, and 40-45 currently amended.

A discussion of the amendments to the specification and the claims informs the remainder of the office action. Applicants have presented an amendment to the specification, specifically an amendment to page 11, lines 4-13 of the Substitute Specification. This amendment changes "particles" to "particle" (*i.e.* the plural to the singular). Because the originally filed specification contained the word "particle" (*i.e.* in the singular), this amendment does not add new matter. As such, the amendment will be entered.

Void ratio (or void fraction) is a term of art. It is generally understood to be a representation of the empty space in a particular reactor with a particular catalyst, or a measure of the closeness of the catalyst particles. For example, see the discussion in US 3,990,964 to Gustafson at 2: 65 *et seq.* It was this interpretation that served as the basis for the rejection in the Final Office Action dated 1/6/2009. The amended portion of the specification, which would

appear to be the support for the amendment to the claims, now refers to the “void ratio” of a *single* catalyst particle. There are certain ambiguities associated with this new language that are addressed in the Claim Rejections under 35 U.S.C. 112, *infra*.

Response to Arguments

Claim Rejections – 35 U.S.C. §112

With respect to the rejections of Claims 4 and 37 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, cancellation of the terms “vigorously” and “calm” from Claims 4 and 37 obviates the rejection. Accordingly, the rejection is WITHDRAWN.

Claim Rejections – 35 U.S.C. §103

With respect to the rejections of Claims 1-4, 8-11, 13, 15-26, 28, 32-41, and 43-47 under 35 U.S.C. 102(b) as being anticipated by US 6,413,487 to Resasco, et al. in view of US 5,618,875 to Baker and Ergun, et al., *Fluid Flow through Randomly Packed Columns and Fluidized Beds*, Ind. Eng. Chem. 1949; 41(6): 1179-1184 (hereinafter “Ergun at ___”), Applicants present a lengthy traversal based on the claims as *now* amended. See (Remarks of 5/06/2009). These have been considered and are persuasive in light of the amendments. Succinctly stated, the claims as previously presented were interpreted as requiring the specified void fraction of the fluidized bed. As now drafted, the claims *might* require a specific void fraction of the catalyst particle itself. In light of this amendment, the rejection is WITHDRAWN, but updated *infra*.

With respect to the rejections of Claims 15-18 and 44-47 under 35 U.S.C. 103(a) as being unpatentable over Resasco, Rodriguez and Ergun as applied to claims 1 above, and further in view of US 6,645,455 to Margrave, et al., the rejection is WITHDRAWN in light of the amendment as noted above, but updated *infra*.

With respect to the rejections of Claim 12 and 42 under 35 U.S.C. 103(a) as being unpatentable over Resasco, Rodriguez and Ergun as applied to claims 1 and 36 above, and further in view of US 6,761,870 to Smalley, et al., the rejection is WITHDRAWN in light of the amendment as noted above, but updated *infra*.

With respect to the rejections of Claim 27 under 35 U.S.C. 103(a) as being unpatentable over Resasco, Rodriguez and Ergun as applied to claim 19 above, and further in view of US 5,102,647 to Yamada, et al., the rejection is WITHDRAWN in light of the amendment as noted above, but updated *infra*.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

I. Claims 1-4, 8-13, 15-28, 32-37, and 39-47 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With respect to Claims 1, 19, and 36 (*i.e.* all independent claims), these claims recite “a void ratio of *each of* the closely packed fine particles.” As noted above, the conventional usage of this term (“void ratio”) would seem to refer to the empty space in a reactor or the closeness of the particles with respect to one another. This construction was also argued in previous responses

to office actions. *See* (Remarks of 9/23/2008 at 12) ("On the contrary, the present invention is directed to a void ratio between the fine particles where carbon nanofibers grow.") (emphasis in original). The claims as currently drafted refer to a void ratio of *each catalyst particle*. This term is not understood in light of the disclosure.

The plain meaning of the language would seem to imply that some empty space or void within the catalyst itself is intended. Indeed, many catalysts are porous or are deposited on supports that are porous. Note however the portion of the disclosure (substitute specification) amended in the most amendment which states "[a] closely packed fine particle means a fine particle with high strength, *which is not porous.*" (S. 11: 23-24) (emphasis added). This would seem to be a fairly unequivocal definition that the catalysts are solid or non-porous. The next sentence however, would seem to imply that the catalysts are in fact porous. (S. 11: 24 *et seq.*). Furthermore, various dependent claims would seem to present embodiments of "fine particles" that are porous. For example, Claim 8 recites "aluminosilicate," a material which is known to be porous. *See e.g.* Zhang, et al., *Mesoporous Aluminosilicates with Ordered Hexagonal Structure, Strong Acidity, and Extraordinary Hydrothermal Stability at High Temperatures*, J. Am. Chem. Soc. 2001; 123: 5014-5021. Note that Zhang is describing a material that is porous. *See e.g.* (Zhang at 5015) ("The pore-size distribution for mesopores was calculated by using the Barrett-Joyner-Halenda (BJH) model.").

The indefiniteness issues with respect to the independent claims might be summarized as such: The claims recite a term ("void ratio") that has been used in connection with fluidized bed reactors. Applicants appear to be claiming fluidized beds. *See* Claim 2 ("fluidizing layer reaction process"). As now amended, the claims would appear use "void ratio" to modify the "fine

particles," or catalyst. The specification however explicitly defines "fine particles" as something "which is not porous." (S. 11: 24). The conflict between the well established use of "void ratio" and the current attempted use which conflicts with an explicit definition in the specification makes a proper claim construction (and in turn search) difficult.

Certain dependent claims contain ambiguities. For example, with respect to Claim 15, it is unclear what order of steps is required. For example, is the acid wash followed by a wash of the "organic compound solution," or is the "organic compound solution" added to the acid prior to washing the nanotubes? Claim 44 shares similar ambiguities. All other dependent claims not discussed import the ambiguities associated with the independent claims and/or claims from which they depend.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

I. Claims 1-3, 8-11, 13, 19-26, 32-37, 39-41, and 43 are rejected under 35 U.S.C. 102(b) as being anticipated by US 6,413,487 to Resasco, et al. in view of Ergun, et al., *Fluid Flow through Randomly Packed Columns and Fluidized Beds*, Ind. Eng. Chem. 1949; 41(6): 1179-1184 (hereinafter "Ergun at ___").

With respect to Claims 1 and 36, Resasco recites a method of producing carbon nanotubes. *See e.g.* (Resasco 3: 28 *et seq.*). "Fine particles" (i.e. catalysts) are employed, and the nanotubes grow on the catalyst. *See e.g.* (Resasco 4: 15-26). Nanotube/catalyst recovery is taught. *See e.g.* (Resasco 4: 40 *et seq.*). Note at least with respect to Claim 36, the particles are taught. (Resasco 7: 58-62).

To the extent Resasco *may* not recite the void ratios claimed *in haec verba*, this does not impart patentability. Note at least for purposes of this rejection, the Examiner is interpreting “void ratio” to refer to the bed of particles. *See* Claim Rejections – 35 U.S.C. 112 *supra*. Resasco makes mention of a fluidized bed reactor. *See e.g.* (Resasco 12: 47-48). Furthermore, Resasco explicitly recites variables that affect the nanotube/nanofiber yield. Resasco states:

For example, the yield of nanotubes is affected by the catalyst formulation (e.g., transition metal ratio, type of support, and metal loading), *by the operating parameters* (e.g., reaction temperature, catalytic *gas pressure, space velocity and reaction time*), and by pretreatment conditions (e.g., reduction and calcination).

(Resasco 3: 59-64) (emphasis added). Thus, there is a very clear, explicit teaching of the result-effective variables in the Resasco process. Void fraction (i.e. the “empty space” in the catalyst bed) is closely intertwined with pressure, space velocity and reaction time. This teaching is reflected in the literature. *See e.g.* (Ergun at 1182 *et seq.*) (noting the relationship between void volume and flow rate). Optimizing this, especially when Resasco teaches that it effects yield, is well within the level of skill in the art (which as previously noted, was a skilled chemist or chemical engineer).

As to Claims 2 and 37, a “fluidized bed” process – which is being interpreted as the “fluidizing layer” – is taught. (Resasco 12: 47- 13: 42). As to Claim 37 specifically, the post-reaction treatment is taught. (Resasco 4: 40 *et seq.*). As to Claim 3, the catalyst is fluidized and carbon nanotubes grow from the catalysts. (Resasco 12: 47- 13: 42). As to Claim 4 the post-reaction treatment is taught. (Resasco 4: 40 *et seq.*) As to Claim 8, silica, alumina and other zeolites are taught. (Resasco 7: 58-62). As to Claims 9 and 39, any number of separation and recycle steps are taught. *See e.g.* (Resasco “Fig 4,” and accompanying text). As to Claims 10 and

40, these claims read on a catalyst on a support, clearly taught by Resasco. (Resasco 7: 52 *et seq.*). As to Claims 11 and 41, any number of metals – including Group VIII (Co, Ni, Pt) are taught. (Resasco 7: 12 *et seq.*). As to Claims 13 and 43, “additive particles” are taught. (Resasco col. 7-8). The zeolites are different shapes than the metal particles. *Id.*

With respect to Claim 19, Resasco teaches reactors with heating means and catalyst recovery separation means. (Resasco “Figures 2-5,” 9: 1 *et seq.*). To the extent Resasco may not recite *in haec verba* a “heating apparatus,” it is expected to necessarily disclose one. Note that Resasco makes numerous mention of heating steps. *See e.g.* (Resasco 3: 65 *et seq.*, 7: 1 *et seq.*). This is the evidence offered to prove inherency. “[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency’ under 35 U.S.C. 102, on *prima facie* obviousness’ under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted].” The burden of proof is similar to that required with respect to product-by-process claims. In re Fitzgerald, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)). See above with respect to the void fraction, but also note that the apparatus is not limited by the material worked on. MPEP 2115. As to Claim 20, a fluidized bed reactor (i.e. the “fluidizing layer reaction apparatus”) is taught. *See e.g.* (Resasco 12: 47 *et seq.*). As to Claim 21, a “catalyst supplying apparatus” is taught. *See e.g.* (Resasco 9: 55 *et seq.*). As to Claim 22, a gas is considered a liquid, and as such, a fluidized bed reactor supplies the catalyst in the presence of a gas, or something in the “liquefied state.” *See* (Resasco 3: 65 *et seq.*) As to Claims 23-26, a “catalyst supplying apparatus” is taught. *See Id.* Note that “solid” catalysts are taught. (Resasco 7: 12 *et seq.*). See

above with respect to the fluidized bed - as the bed is fluidized, it necessarily has a gas supplying apparatus. *See also* (Resasco "Figs. 2-5"). As to Claim 32, see discussion of Claim 8 *supra*. As to Claim 33, Resasco recites pressures above 0.01 MPa (Resasco 4: 10-15) and temperatures in the claimed range. (Resasco 7: 1-5). As to Claim 34, Resasco teaches a collision unit. *See e.g.* (Resasco "Fig. 2") and (Resasco 9: 1 *et seq.*) Catalysts collide with any of the parts shown or disclosed. Therefore, a "collision unit" is taught. As to Claim 35, heat transfer is described. *Id.*

II. Claim 28 rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco and Ergun as applied to claim 19 above, and further in view of US 5,618,875 to Baker to show a state of fact.

The preceding discussion of Resasco and Ergun is expressly incorporated herein by reference. As to Claim 28, to the extent Resasco *may* not recite *in haec verba* the catalyst (i.e. "fine particle") diameter, it is expected that the diameter is necessarily disclosed. It is well known that the diameter of carbon nanotubes/nanofibers is controlled by the diameter of the catalyst particle. This teaching is reflected in numerous places, for example US 5,618,875 to Baker, et al. *See* (Baker 5: 9-10) ("The catalyst particle size determines the diameter of the filament") Baker, like Resasco, teaches the production of carbon nanofibers. *See* (Baker 3: 10 *et seq.*). Baker also teaches catalyst sizes of 25 Å (= 2.5 nm, *i.e.* within the claimed range). (Baker 5: 8). Therefore, it is expected that the catalysts (i.e. fine particles) as taught in the apparatus of Resasco have the same size as claimed. This is the evidence offered to prove inherency. "[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on

inherency' under 35 U.S.C. 102, on prima facie obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted].” The burden of proof is similar to that required with respect to product-by-process claims. *In re Fitzgerald*, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)).

III. Claim 28 rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco and Ergun as applied to claim 19 above, and further in view of US 5,618,875 to Baker.

The preceding discussion of Resasco and Ergun accompanying the obviousness rejection *supra* is expressly incorporated herein by reference. As to Claim 28, to the extent Resasco *may* not recite *in haec verba* the catalyst (i.e. “fine particle”) diameter, catalyst diameter is a known result-effective variable. *See* (Baker 5: 9-10). Optimization of this does not impart patentability. MPEP 2144.05.

IV. Claims 15-18 and 44-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco and Ergun as applied to claims 1 above, and further in view of US 6,645,455 to Margrave, et al.

The preceding discussion of Resasco and Ergun accompanying the obviousness rejection *supra* is expressly incorporated herein by reference. With respect to Claims 15-18 and 44-47, notwithstanding the ambiguities noted above, note that Resasco employs washes in a variety of compounds: acidic, organic, etc. (Resasco 4: 42 *et seq.*). To the extent Resasco may not teach whatever is being claimed, Margrave teaches the compounds claimed. *See* (Margrave 7: 50 *et seq.*). One would be motivated to use such compounds, because they make nanotubes. *See Id.*

V. Claim 12 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco and Ergun as applied to claims 1 and 36 above, and further in view of US 6,761,870 to Smalley, et al.

The preceding discussion of Resasco and Ergun accompanying the obviousness rejection *supra* is expressly incorporated herein by reference. To the extent Resasco *may* not teach sulfur, this does not impart patentability. Sulfur is a well known catalyst promoter, and the Examiner takes official notice that it is. In support of taking official notices (i.e. in making sure there is substantial evidence on the record), the Examiner provides Smalley. *See e.g.* (Smalley 3: 28 *et seq.*). One would be motivated to use sulfur for any number of reasons, for example promoting the catalytic reaction.

VI. Claim 27 rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco and Ergun as applied to claim 19 above, and further in view of US 5,102,647 to Yamada, et al.

The preceding discussion of Resasco and Ergun accompanying the obviousness rejection *supra* is expressly incorporated herein by reference. To the extent Resasco *may* not teach a rotary drum/kiln embodiment, these reactors are old, known, and an obvious expedient. *See e.g.* (Yamada 6: 5 *et seq.*) (describing rotary kilns and fluidized beds).

VII. Claims 1-3, 8-11, 13, 19-26, 32-37, 39-41, and 43 are rejected under 35 U.S.C. 102(b) as being anticipated by US 6,413,487 to Resasco, et al. in view of Kim, et al., *Synthesis and Pore Size Control of Cubic Mesoporous Silica SBA-1*, Chem. Mater. 1999; 11: 487-491 (hereinafter “Kim at ___”).

The preceding discussion of Resasco and Ergun accompanying the obviousness rejection *supra* is expressly incorporated herein by reference and is relied upon for identified the claimed features. To the extent the “void ratio” language of the independent claims is meant to imply the

porosity of the catalyst, and notwithstanding the ambiguities noted with this construction, note that Resasco – like Applicants – teaches employing zeolites as the catalyst support. (Resasco 58-62). Note also the teachings of Resasco which state:

[T]he yield of nanotubes is affected by the *catalyst formulation (e.g., transition metal ratio, type of support, and metal loading)*, by the operating parameters (e.g., reaction temperature, catalytic gas pressure, space velocity and reaction time), and by pretreatment conditions (e.g., reduction and calcination).

(Resasco 3: 59-64) (emphasis added). Optimizing the porosity of the catalyst when it is a known result-effective variable does not impart patentability. MPEP 2144.05. Control of pore size (and in turn volume, void fraction, etc.) is well within the skill in the art. *See e.g.* (Kim at 491, “Table 2”) (illustrating the control over pore size by varying synthesis conditions). Pore volume/size would affect gas diffusion. Notwithstanding the ambiguities noted in other places in this office action, control of the “void ratio” of individual catalyst particles would appear to be “[a]pplying a known technique to a known device (method, or product) ready for improvement to yield predictable results.” MPEP 2143. Here, control of pore volume (Kim) is known. Resasco suggests that this affects yield. (Resasco 3: 59-64). The results (i.e. making nanotubes/nanofibers) appear predictable. Likewise, the results achieved (making nanotubes/nanofibers) appear to be entirely expected, *i.e.* there are no “unexpected” results.

VIII. Claim 28 rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco and Kim as applied to claim 19 above, and further in view of US 5,618,875 to Baker to show a state of fact.

The preceding discussion of Resasco and Ergun is expressly incorporated herein by reference. As to Claim 28, to the extent Resasco *may* not recite *in haec verba* the catalyst (i.e. "fine particle") diameter, it is expected that the diameter is necessarily disclosed. It is well known that the diameter of carbon nanotubes/nanofibers is controlled by the diameter of the catalyst particle. This teaching is reflected in numerous places, for example US 5,618,875 to Baker, et al. *See* (Baker 5: 9-10) ("The catalyst particle size determines the diameter of the filament") Baker, like Resasco, teaches the production of carbon nanofibers. *See* (Baker 3: 10 *et seq.*). Baker also teaches catalyst sizes of 25 Å (= 2.5 nm, *i.e.* within the claimed range). (Baker 5: 8). Therefore, it is expected that the catalysts (i.e. fine particles) as taught in the apparatus of Resasco have the same size as claimed. This is the evidence offered to prove inherency. "[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency' under 35 U.S.C. 102, on prima facie obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted]." The burden of proof is similar to that required with respect to product-by-process claims. *In re Fitzgerald*, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)).

IX. Claim 28 rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco and Kim as applied to claim 19 above, and further in view of US 5,618,875 to Baker.

The preceding discussion of Resasco and Ergun accompanying the obviousness rejection *supra* is expressly incorporated herein by reference. As to Claim 28, to the extent Resasco *may* not recite *in haec verba* the catalyst (i.e. "fine particle") diameter, catalyst diameter is a known

result-effective variable. *See* (Baker 5: 9-10). Optimization of this does not impart patentability. MPEP 2144.05.

X. Claims 15-18 and 44-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco and Kim as applied to claims 1 above, and further in view of US 6,645,455 to Margrave, et al.

The preceding discussion of Resasco and Ergun accompanying the obviousness rejection *supra* is expressly incorporated herein by reference. With respect to Claims 15-18 and 44-47, notwithstanding the ambiguities noted above, note that Resasco employs washes in a variety of compounds: acidic, organic, etc. (Resasco 4: 42 *et seq.*). To the extent Resasco may not teach whatever is being claimed, Margrave teaches the compounds claimed. *See* (Margrave 7: 50 *et seq.*). One would be motivated to use such compounds, because they make nanotubes. *See Id.*

XI. Claim 12 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco and Kim as applied to claims 1 and 36 above, and further in view of US 6,761,870 to Smalley, et al.

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XII. Claim 27 rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco and Kim as applied to claim 19 above, and further in view of US 5,102,647 to Yamada, et al.

The preceding discussion of Resasco and Ergun accompanying the obviousness rejection *supra* is expressly incorporated herein by reference. To the extent Resasco *may* not teach a rotary drum/kiln embodiment, these reactors are old, known, and an obvious expedient. *See e.g.* (Yamada 6: 5 et seq) (describing rotary kilns and fluidized beds).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL C. MCCracken whose telephone number is (571)272-6537. The examiner can normally be reached on Monday through Friday, 9 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley S. Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Daniel C. McCracken/
Daniel C. McCracken
Examiner, Art Unit 1793
DCM

/Stanley S. Silverman/
SPE, Art Unit 1793